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19   **UNITED STATES DISTRICT COURT**
              NORTHERN DISTRICT OF CALIFORNIA
20   **SAN FRANCISCO DIVISION**

21 GRACE LAU, CHRISTOPHER   CASE NO. 3:22-cv-08981-RFL
   KARWOWSKI, MELODY KLEIN,
22 MICHAEL MCBRIDE, and AIMEN HALIM,   **DECLARATION OF ZUBAIR SHAFIQ IN**
   individual and on behalf of all others similarly   **SUPPORT OF PLAINTIFFS' MOTION**
23 situated;   **TO COMPEL COMPLIANCE WITH**
                                      SUBPOENAS PURSUANT TO FEDERAL
24   Plaintiffs,   **RULE OF CIVIL PROCEDURE 45**

25   vs.

26 GEN DIGITAL INC. a corporation, and
   JUMPSHOT INC., a corporation,
27
             Defendants.
28

DECLARATION OF ZUBAIR SHAFIQ

I, Zubair Shafiq, Ph.D., declare as follows:

1.   I am an Associate Professor of Computer Science at the University of California-Davis. I have been retained by counsel for Plaintiffs to serve as an independent expert in this litigation and to provide opinions and testimony regarding the technology and practices at issue with respect to data sharing and in particular, server-to-server communication.

2.   This Declaration contains statements of my opinions formed to date and the bases and reasons for those opinions. I understand from counsel that discovery in this case is ongoing, and I may offer additional opinions based on further review of materials in this case, including opinions and/or testimony of other expert witnesses. I reserve the right to amend or supplement my opinions based on further discovery and information provided in this case that was not available to me at the time I prepared this Declaration, as well as based on further information, analysis, or opinions provided by Defendant or experts retained by Defendant.

3.   I am familiar with the facts contained herein based upon my personal knowledge, analysis, and upon information provided by Plaintiffs' Counsel, and if called as a witness, could and would testify competently thereto. I submit this declaration at the request of Plaintiffs' Counsel in connection with the above-captioned action.

4.   The opinions expressed in this Declaration are based on my own personal knowledge, professional judgment, and my analysis of the materials and information I considered in preparing this Declaration, which are listed throughout.

5.   I am being compensated for my work in this case at the rate of $750 per hour, which is my standard hourly rate. My compensation is not dependent on and in no way affects the substance of my opinions. Nor does my compensation depend on the outcome of this proceeding. I understand that, should there be any recovery in this case, I will be excluded from any disbursement of funds.

A.   Background of Server-to-Server tracking.

6.   Online tracking refers to the practice of collecting and sharing user data on and across different websites. More concretely, a tracker can figure out that a particular user visited $website_1$ at $time_1$, $website_2$ at $time_2$, and so on.

7.   The user data is typically comprised of (1) identifiers and (2) browsing activity. The identifiers include cookies, IP address, user agent, etc. The browsing activity includes website domain names, URLs, title and description, search terms, etc.

8.   Trackers typically collect user data to infer user attributes and interests that are then used to inform online advertising campaigns. More specifically, the user data is used to personalize ads based on inferred user attributes and interests.

9.   Well-known online trackers include the likes of Google, Facebook/Meta, Adobe, Amazon, etc.[1] Some of these trackers include data brokers,[2] who further buy and sell user on online advertising exchanges and data marketplaces.[3]

10.   There are two types of online tracking: client-to-server (or client-side) and server-to-server (or server-side).

       a.   In client-to-server (or client-side) tracking, a tracker collects user data from a user's web browser. To this end, the tracker is typically installed in the website's HTML as an invisible script or image. Once the tracker loads during the webpage loading process, a network transmission from a user's browser to the tracker's server is sent with user data.

       b.   In server-to-server (or server-side) tracking, a tracker collects user data from a container server (in control of the website or some third-party), which in turn collects user data directly from the web browser. To this end, a network transmission from

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[1] *DuckDuckGo Tracker Radar Exposes Hidden Tracking*, Spread Privacy (Mar. 5, 2020), https://spreadprivacy.com/duckduckgo-tracker-radar/.
[2] Alyssa Boyle, "What Is A Data Broker?," AdExchanger (Mar. 5, 2024), https://www.adexchanger.com/adexplainer/what-is-a-data-broker/.
[3] Attorney General Rob Bonta, Data Broker Registry, California Dept. of Justice, https://oag.ca.gov/data-brokers.

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the container server, which collects user data from a user's browser like client-to-server tracking, to the tracker's server is sent with user data.

11.   The following figure illustrates the difference between client-to-server and server-to-server tracking. The unique feature of server-to-server is that user data is shared between servers.
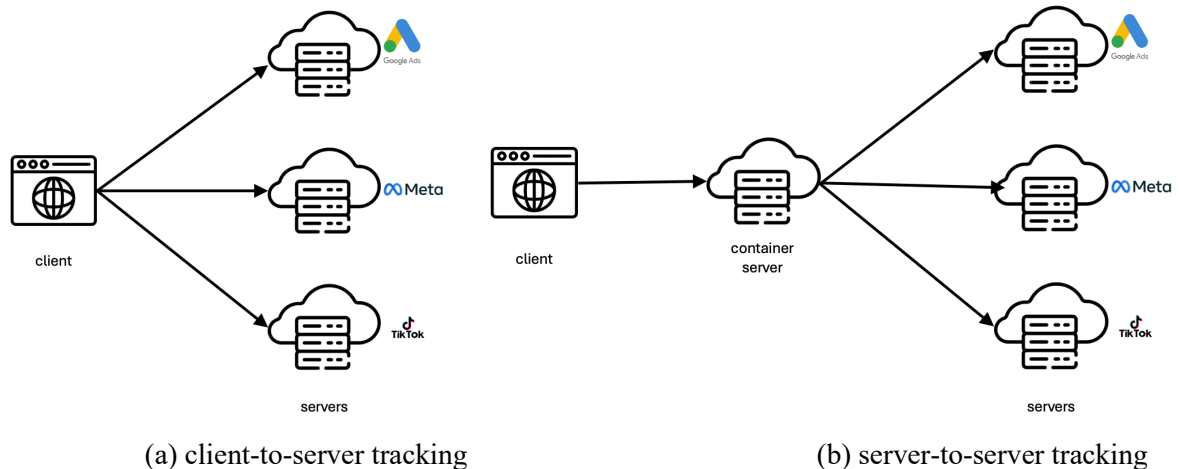

(a) client-to-server tracking   (b) server-to-server tracking

Figure 1: Client-to-server vs. server-to-server tracking

B.   How common is server-to-server tracking?

12.   As privacy protective features are becoming more available and used that limit the effectiveness of client-to-server tracking, trackers are shifting from client-to-server tracking to server-to-sever tracking.[4]

13.   Server-to-server tracking is less transparent to consumers than client-to-server-tracking. While client-to-server tracking can be directly observed in a web browser, server-to-server tracking is fully invisible to users.

14.   Server-to-server tracking circumvents anti-tracking features (e.g., ad

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[4] Jon Phillips, "Why You Need to Transition to Server-Side Tracking," BeFoundOnline (Feb. 24, 2023), https://befoundonline.com/blog/why-you-need-to-transition-to-server-side-tracking.

1   blockers) that limit the effectiveness of client-to-server tracking. [5,6]

2   15.   The scientific community has started to investigate the prevalence of server-

3   to-server tracking.[7,8,9] For example, Fouad et al. found that 389 out of 7367 websites in

4   their study used server-to-server tracking where the container server was cloaked as a first-

5   party server.[10] They found evidence that top trackers such as Google and Meta/Facebook

6   have shifted to server-to-server tracking.

7   16.   Today, server-side tracking is offered by all major companies that do

8   tracking, including Google,[11] Meta/Facebook,[12] TikTok,[13] Pinterest,[14] Snapchat,[15] etc. [16]

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10   [5] Stape, "How to set up TikTok Events API," (Jun. 18, 2024), https://stape.io/blog/how-to-set-up-tiktok-events-api ("With server-side tracking, you will be able to collect more events. TikTok events API is resistant to ad blockers, ITPs, and other tracking restrictions.")

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12   [6] Dario Villi, "How to move past cookies with server-to-server tracking," LeadsBridge (Dec. 4, 2023), https://leadsbridge.com/blog/server-to-server-tracking/ ("Considering the increasing privacy regulations and the growing use of ad blockers, other methods of client-side tracking are becoming less popular.")

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14   [7] Nardjes Amieur, et al., *Client-side and Server-side Tracking on Meta: Effectiveness and Accuracy*, Proceedings on Privacy Enhancing Technologies 2024(3), 431-445 (July 2024), https://petsymposium.org/popets/2024/popets-2024-0086.pdf.

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16   [8] Imane Fouad, et al., *The Devil is in the Details: Detection, Measurement and Lawfulness of Server-Side Tracking on the Web*, Proceedings on Privacy Enhancing Technologies 2024(3) (July 2024), https://petsymposium.org/popets/2024/popets-2024-0125.pdf.

17   [9] John Cook, et al., *Inferring Tracker-Advertiser Relationships in the Online Advertising Ecosystem using Header Bidding*, Proceedings on Privacy Enhancing Technologies 2020(1), 18 (2020), https://petsymposium.org/popets/2020/popets-2020-0005.pdf.

18   [10] *See* Imane Fouad, et al., *supra*, n.8.

19   [11] *An Introduction to Server-Side Tagging*, Google Tag Manager (Aug. 26, 2024), https://developers.google.com/tag-platform/tag-manager/server-side/intro.

20   [12] *Conversions API*, Meta for Developers (Aug. 25, 2024), https://developers.facebook.com/docs/marketing-api/conversions-api/.

21   [13] *About Events API*, TikTok Business Help Center (Aug. 25, 2024), https://ads.tiktok.com/help/article/events-api.

22   [14] *The Pinterest Conversions API*, Pinterest Help Center (Aug. 25, 2024), https://help.pinterest.com/en/business/article/the-pinterest-api-for-conversions.

23

24   [15] *What Is Conversions API (CAPI)*, Snapchat Business Help Center (Aug. 25, 2024), https://businesshelp.snapchat.com/s/article/conversions-api?language=en_US.

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26   [16] John Phillips, *supra*, n.4 ("With server-side tracking, we can send data just about anywhere. Beyond the Google products listed in our introduction, Facebook, TikTok,

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17. Google Tag Manager, which is a general-purpose tag management service, offers server-to-server tracking that it calls "server-side tagging".[17,18] Google explains the difference between client-to-server and server-to-server tracking as follows.[19]
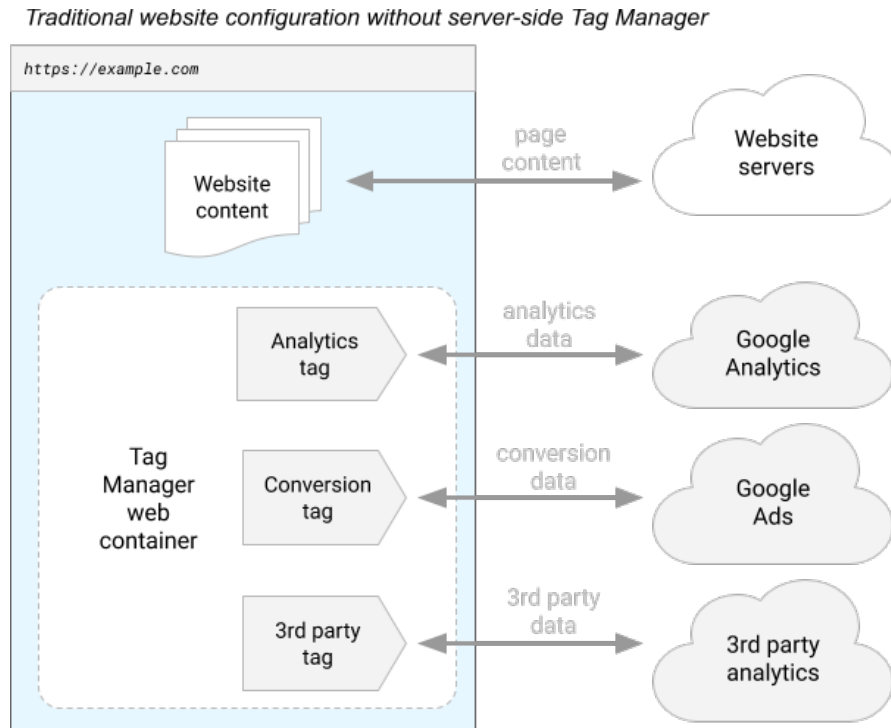
(a) Client-to-server tracking using Google Tag Manager

Hotjar, Hubspot, Klaviyo, Salesforce, Zapier, and many, many more platforms have released support for server-side tracking with Google Tag Manager. It is the future of data tracking for online marketers, and we all are one day going to need to adapt to this reality. Browser tracking will eventually die, pixels will go away. We must adapt and evolve with the modern web or risk being left behind.")
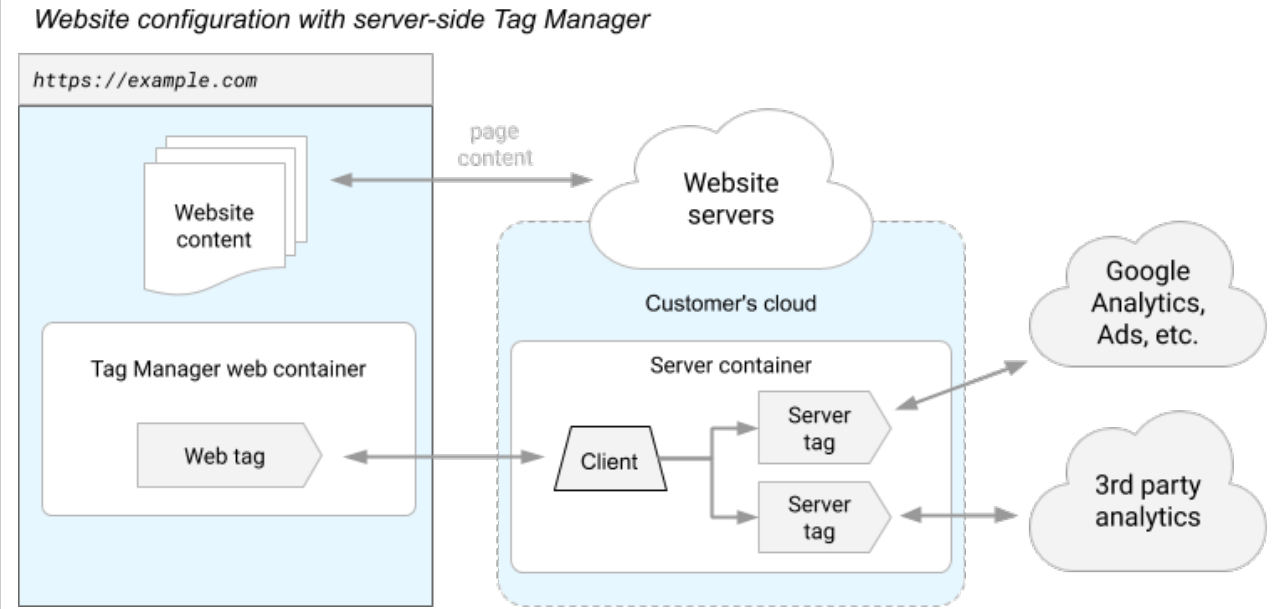
[17] *What is server-side tagging?*, Google Tags (Aug. 25, 2024), https://developers.google.com/tag-platform/tag-manager/server-side.

[18] *An introduction to server-side tagging*, Google Tags (Aug. 25, 2024), https://developers.google.com/tag-platform/tag-manager/server-side/intro.

[19] *Id.*

Website configuration with server-side Tag Manager

(b) Server-to-server tracking using Google Tag Manager

Figure 2: Client-to-server vs. server-to-server tracking in Google Tag Manager

18.   Google Tag Manager's implementation of server-to-server tracking (i.e., server-side tagging) can be used to further share user data with the servers of other tracking companies such as Meta/Facebook,[20] TikTok,[21] LinkedIn,[22] etc.

19.   Meta/Facebook offers server-to-server tracking that it calls Conversions API.[23] Unlike Meta/Facebook Pixel which is a client-to-server tracking tool, Conversions API sends user data from a server to Meta. The user data that can be shared with Meta via Conversions API includes cookies, IP address, user agent, email address, webpage URL, etc.[24, 25]

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[20] *Conversions API for Server-Side Google Tag Manager (GTM)*, Meta for Developers (Aug. 25, 2024), https://developers.facebook.com/docs/marketing-api/conversions-api/guides/gtm-server-side/.

[21] *Set Up Events API for Server-Side Tagging in Google Tag Manager*, TikTok Business Help Center (Aug. 25, 2024), https://ads.tiktok.com/help/article/how-to-set-up-events-api-for-server-side-tagging-in-google-tag-manager?lang=en.

[22] *Set up and create conversions using Google Tag Manager*, LinkedIn Help (Aug. 25, 2024), https://www.linkedin.com/help/lms/answer/a1718034.

[23] *See Conversions API, supra*, n.12.

[24] https://developers.facebook.com/docs/marketing-api/conversions-api/best-practices

[25] *Conversions API Parameters*, Meta for Developers (Aug. 25, 2024) https://developers.facebook.com/docs/marketing-api/conversions-api/parameters

1   I declare under penalty of perjury under the laws of the State of California that the

2 foregoing is true and correct.

3

4   Executed August 26, 2024, at Davis, California.

5

6   _____

7   Zubair Shafiq, Ph.D.

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EXHIBIT A

Zubair Shafiq

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Research Interests

Web Privacy, Internet Measurement, Internet Security, Computer Networks

Professional Experience

2020–   **Associate Professor**
Department of Computer Science, University of California-Davis

2014–2020   **Assistant Professor**
Department of Computer Science, University of Iowa

2009–2014   **Research Assistant**
Department of Computer Science and Engineering, Michigan State University

2013   **Research Intern**
IBM T. J. Watson Research Center

2012   **Research Intern**
Telefonica Research

2011   **Research Intern**
AT&T Labs – Research

2007-2009   **Research Engineer**
Next Generation Intelligent Networks Research Center, Pakistan

Education

2009–2014   **Ph.D. Computer Science**
Department of Computer Science and Engineering, Michigan State University

2004–2008   **B.E. Electrical Engineering**
National University of Sciences & Technology (NUST), Pakistan

Honors and Awards

2024   **Caspar Bowden Award**, Runner-up for Outstanding Research in Privacy Enhancing Technologies

2023   **Best Paper Award**, ACM Internet Measurement Conference

2023   **Chancellor's Fellow**, University of California Davis

2020   **Research Highlights**, Communications of the ACM

2020   **Dean's Scholar Award**, University of Iowa

2018   **NSF Faculty Early Career Development (CAREER) Award**

2018   **Andreas Pfitzmann Award**, Best Student Paper at Privacy Enhancing Technologies Symposium

2017   **Best Paper Award**, ACM Internet Measurement Conference

2015   **NSF CISE Research Initiation Initiative (CRII) Award**

2013   **Fitch-Beach Outstanding Graduate Research Award**, Michigan State University

2012   **Best Paper Award**, IEEE International Conference on Network Protocols

2007, 2008 **Dean's Plaque of Excellence**, National University of Sciences & Technology, Pakistan

Publications

CCS **Blocking Tracking JavaScript at the Function Granularity**
Abdul Haddi Amjad, Shaoor Munir, Zubair Shafiq, Muhammad Ali Gulzar
ACM Conference on Computer and Communications Security, 2024 (in press)

USENIX **PURL: Safe and Effective Sanitization of Link Decoration**
Security Shaoor Munir, Patrick Lee, Umar Iqbal, Zubair Shafiq, Sandra Siby
USENIX Security Symposium, 2024 (in press)

JETLaw **Google's Chrome Antitrust Paradox**
Shaoor Munir, Konrad Kollnig, Anastasia Shuba, Zubair Shafiq
Vanderbilt Journal of Entertainment and Technology Law, 2024 (in press)

IMWUT/ **Aragorn: A Privacy-Enhancing System for Mobile Cameras**
UbiComp Hari Venugopalan, Zainul Abi Din, Trevor Carpenter, Jason Lowe-Power, Sam King, Zubair Shafiq
ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, 2024 (in press)

CHI **Understanding Underground Incentivized Review Services**
Rajvardhan Oak, Zubair Shafiq
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S&P **The Inventory is Dark and Full of Misinformation: Understanding the Abuse of Ad Inventory Pooling in the Ad-Tech Supply Chain**
Yash Vekaria, Rishab Nithyanand, Zubair Shafiq
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JOLT **A Scientific Approach to Tech Accountability**
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Beyond the FTC: The Future of Privacy Enforcement, Harvard Journal of Law & Technology, 2023

PNAS **Auditing YouTube's Recommendation System for Ideologically Congenial, Extreme, and Problematic Recommendations**
Muhammad Haroon, Magdalena Wojcieszak, Anshuman Chhabra, Xin Liu, Prasant Mohapatra, Zubair Shafiq
Proceedings of the National Academy of Sciences (PNAS), 2023

IMC **Tracking, Profiling, and Ad Targeting in the Alexa Echo Smart Speaker Ecosystem**
Umar Iqbal, Pouneh Nikkhah Bahrami, Rahmadi Trimananda, Hao Cui, Alexander Gamero-Garrido, Daniel Dubois, David Choffnes, Athina Markopoulou, Franziska Roesner, Zubair Shafiq
ACM Internet Measurement Conference, 2023
Best Paper Award

PETS **A Utility-Preserving Obfuscation Approach for YouTube Recommendations**
Jiang Zhang, Hadi Askari, Konstantinos Psounis, Zubair Shafiq
Privacy Enhancing Technologies Symposium, 2023

PETS **Blocking JavaScript without Breaking the Web**
Abdul Haddi Amjad, Zubair Shafiq, Muhammad Ali Gulzar
Privacy Enhancing Technologies Symposium, 2023

CCS **CookieGraph: Measuring and Countering First-Party Tracking Cookies**
Shaoor Munir, Sandra Siby, Umar Iqbal, Steven Englehardt, Zubair Shafiq, Carmela Troncoso
ACM Conference on Computer and Communications Security, 2023

S&P **Accuracy-Privacy Trade-off in Deep Ensemble: A Membership Inference Perspective**
Shahbaz Rezaei, Zubair Shafiq, Xin Liu
IEEE Symposium on Security & Privacy, 2023

USENIX **AutoFR: Automated Filter Rule Generation for Adblocking**
Security Hieu Le, Salma Elmalaki, Athina Markopoulou, Zubair Shafiq
USENIX Security Symposium, 2023

NDSS **Harpo: Learning to Subvert Online Behavioral Advertising**
Jiang Zhang, Konstantinos Psounis, Muhammad Haroon, Zubair Shafiq
Network and Distributed System Security Symposium, 2022

USENIX **WebGraph: Capturing Advertising and Tracking Information Flows for Robust Blocking**
Security Sandra Siby, Umar Iqbal, Steven Englehardt, Zubair Shafiq, Carmela Troncoso
USENIX Security Symposium, 2022

USENIX **Khaleesi: Breaker of Advertising and Tracking Request Chains**
Security Umar Iqbal, Charlie Wolfe, Charles Nguyen, Steven Englehardt, Zubair Shafiq
USENIX Security Symposium, 2022

PETS **FP-Radar: Longitudinal Measurement and Early Detection of Browser Fingerprinting**
Pouneh Nikkhah Bahrami, Umar Iqbal, Zubair Shafiq
Privacy Enhancing Technologies Symposium, 2022

ACL **Adversarial Authorship Attribution for Deobfuscation**
Wanyue Zhai, Jonathan Rusert, Zubair Shafiq, Padmini Srinivasan
Association for Computational Linguistics, 2022

ACL **On the Robustness of Offensive Language Classifiers**
Jonathan Rusert, Zubair Shafiq, Padmini Srinivasan
Association for Computational Linguistics, 2022

EuroS&P **DNN Model Architecture Fingerprinting Attack on CPU-GPU Edge Devices**
Kartik Patwari, Syed Mahbub Hafiz, Han Wang, Houman Homayoun, Zubair Shafiq, Chen-Nee Chuah
IEEE European Symposium on Security and Privacy, 2022

DATE **Stealthy Inference Attack on DNN via Cache-based Side-channel Attacks**
Han Wang, Syed Mahbub Hafiz, Kartik Patwari, Chen-Nee Chuah, Zubair Shafiq, Houman Homayoun
IEEE/ACM Design Automation and Test in Europe, 2022

IMC **TrackerSift: Untangling Mixed Tracking and Functional Web Resources**
Abdul Haddi Amjad, Danial Saleem, Fareed Zaffar, Muhammad Ali Gulzar, Zubair Shafiq
ACM Internet Measurement Conference, 2021

S&P **Fingerprinting the Fingerprinters: Learning to Detect Browser Fingerprinting Behaviors**
Umar Iqbal, Steven Englehardt, Zubair Shafiq
IEEE Symposium on Security & Privacy, 2021

NDSS **CV-Inspector: Towards Automating Detection of Adblock Circumvention**
Hieu Le, Athina Markopoulou, Zubair Shafiq
Network and Distributed System Security Symposium, 2021

EACL **Through the Looking Glass: Learning to Attribute Synthetic Text Generated by Language Models**
Shaoor Munirl, Brishna Batool, Zubair Shafiq, Padmini Srinivasan, Fareed Zaffar
European Chapter of the Association for Computational Linguistics, 2021

IMC **Understanding Incentivized Mobile App Installs on Google Play Store**
Shehroze Farooqi, Alvaro Feal, Tobias Lauinger, Damon McCoy, Zubair Shafiq, Narseo Vallina-Rodriguez
ACM Internet Measurement Conference, 2020

ACL **A Girl Has A Name: Detecting Authorship Obfuscation**
Asad Mahmood, Zubair Shafiq, Padmini Srinivasan
Annual Conference of the Association for Computational Linguistics, 2020

S&P **AdGraph: A Graph-Based Approach to Ad and Tracker Blocking**
Umar Iqbal, Peter Snyder, Shitong Zhu, Benjamin Livshits, Zhiyun Qian, Zubair Shafiq
IEEE Symposium on Security & Privacy, San Francisco, 2020

PETS **CanaryTrap: Detecting Data Misuse by Third-Party Apps on Online Social Networks**
Shehroze Farooqi, Maaz Musa, Zubair Shafiq, Fareed Zaffar
Privacy Enhancing Technologies Symposium, Montreal, 2020

PETS **Inferring Tracker-Advertiser Relationships in the Online Advertising Ecosystem**
John Cook, Rishab Nithyanand, Zubair Shafiq
Privacy Enhancing Technologies Symposium, Montreal, 2020

PETS **The TV is Smart and Full of Trackers: Measuring Smart TV Advertising and Tracking**
Janus Varmarken, Hieu Le, Anastasia Shuba, Zubair Shafiq, Athina Markopoulou
Privacy Enhancing Technologies Symposium, Montreal, 2020

IoTDI **Characterizing Smart Home IoT Traffic in the Wild**
M. Hammad Mazhar, Zubair Shafiq
ACM/IEEE Conference on Internet of Things Design and Implementation, Sydney, 2020

PAM **FlowTrace: A Framework for Active Bandwidth Measurements using In-band Packet Trains**
Adnan Ahmed, Ricky Mok, Zubair Shafiq
Passive and Active Measurement Conference, Eugene, 2020

PETS **A Girl Has No Name: Automated Authorship Obfuscation using X-Mutant**
Asad Mahmood, Faizan Ahmad, Zubair Shafiq, Padmini Srinivasan, Fareed Zaffar
Privacy Enhancing Technologies Symposium, Stockholm, 2019

PETS **No Place to Hide: Inadvertent Location Privacy Leaks on Twitter**
Jonathan Rusert, Osama Khalid, Dat Hong, Zubair Shafiq, Padmini Srinivasan
Privacy Enhancing Technologies Symposium, Stockholm, 2019

WWW **Measurement and Early Detection of Third-Party Application Abuse on Twitter**
Shehroze Farooqi, Zubair Shafiq
The Web Conference (WWW), San Francisco, 2019

WWW **ShadowBlock: A Lightweight and Stealthy Adblocking Browser**
Shitong Zhu, Umar Iqbal, Zhongjie Wang, Zhiyun Qian, Zubair Shafiq, Weiteng Chen
The Web Conference (WWW), San Francisco, 2019

WWW **Measuring Political Personalization of Google News Search**
Huyen Le, Raven Maragh, Brian Ekdale, Timothy Havens, Andrew High, Zubair Shafiq
The Web Conference (WWW), San Francisco, 2019

ASONAM **A Postmortem of Suspended Twitter Accounts in the 2016 U.S. Presidential Election**
Huyen Le, Bob Boynton, Zubair Shafiq, Padmini Srinivasan
IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM), Vancouver, 2019

TDSC **Large Scale Characterization of Software Vulnerability Life Cycles**
Muhammad Shahzad, Zubair Shafiq, Alex X. Liu
IEEE Transactions on Dependable and Secure Computing, 2019

PETS **NoMoAds: Effective and Efficient Cross-App Mobile Ad-Blocking**
Anastasia Shuba, Athina Markopoulou, Zubair Shafiq
Privacy Enhancing Technologies Symposium, Barcelona, 2018
Andreas Pfitzmann Best Student Paper Award

NDSS **Measuring and Disrupting Anti-Adblockers Using Differential Execution Analysis**
Shitong Zhu, Xunchao Hu, Zhiyun Qian, Zubair Shafiq, Heng Yin
Network and Distributed System Security Symposium, San Diego, 2018

INFOCOM **Real-time Video Quality of Experience Monitoring for HTTPS and QUIC**
M. Hammad Mazhar, Zubair Shafiq
IEEE International Conference on Computer Communications, Honolulu, 2018

TON **Optimizing Internet Transit Routing for Content Delivery Networks**
Faraz Ahmed, Zubair Shafiq, Amir Khakpour, Alex Liu
IEEE/ACM Transactions on Networking, 2018

TBD **Optimizing Taxi Driver Profit Efficiency: A Spatial Network-based Markov Decision Process Approach**
Xun Zhou, Huigui Rong, Chang Yang, Qun Zhang, Amin Vahedian Khezerlou, Hui Zheng, Zubair Shafiq, Alex Liu
IEEE Transactions on Big Data, 2018

TOPS **Measuring, Characterizing, and Detecting Facebook Like Farms**
Muhammad Ikram, Lucky Onwuzurike, Shehroze Farooqi, Emiliano De Cristofaro, Arik Friedman, Guillaume Jourjon, Dali Kaafar, Zubair Shafiq
ACM Transactions on Privacy and Security, 2017

TIST **A Traffic Flow Approach to Early Detection of Gathering Events: Comprehensive Results**
Amin Khezerlou, Xun Zhou, Lufan Li, Zubair Shafiq, Alex X. Liu, Fan Zhang
ACM Transactions on Intelligent Systems and Technology, 2017

IMC **Measuring and Mitigating OAuth Access Token Abuse by Collusion Networks**
Shehroze Farooqi, Fareed Zaffar, Nektarios Leontiadis, Zubair Shafiq
ACM Internet Measurement Conference, London, 2017
Best Paper Award
CACM Research Highlights 2020

IMC **The Ad Wars: Retrospective Measurement and Analysis of Anti-Adblock Filter Lists**
Umar Iqbal, Zubair Shafiq, Zhiyun Qian
ACM Internet Measurement Conference, London, 2017

SIGMETRICS **Characterizing and Modeling Patching Practices of Industrial Control Systems**
Brandon Wang, Xiaoye Li, Leandro P. de Aguiar, Daniel S. Menasche, Zubair Shafiq
ACM International Conference on Measurement and Modeling of Computer Systems, Urbana-Champaign, 2017

PETS **Detecting Anti Ad-blockers in the Wild**
Muhammad Haris Mughees, Zhiyun Qian, Zubair Shafiq
Privacy Enhancing Technologies Symposium, Minneapolis, 2017

ICDM **Accurate Detection of Automatically Spun Content via Stylometric Analysis**
Usman Shahid, Shehroze Farooqi, Raza Ahmad, Zubair Shafiq, Padmini Srinivasan, Fareed Zaffar
IEEE International Conference on Data Mining, New Orleans, 2017

CHI **Revisiting The American Voter on Twitter**
Huyen Le, G.R. Boynton, Yelena Mejova, Zubair Shafiq, Padmini Srinivasan
ACM Conference on Human Factors in Computing Systems, Denver, 2017

ICDCS **Distributed Load Balancing in Key-Value Networked Caches**
Sikder Huq, Zubair Shafiq, Sukumar Ghosh, Amir Khakpour, Harkeerat Bedi
IEEE International Conference on Distributed Computing Systems, Atlanta, 2017

ICNP **Peering vs. Transit: Performance Comparison of Peering and Transit Interconnections**
Adnan Ahmed, Zubair Shafiq, Harkeerat Bedi, Amir Khakpour
IEEE International Conference on Network Protocols, Toronto, 2017

ICNP **Suffering from Buffering? Detecting QoE Impairments in Live Video Streams**
Adnan Ahmed, Zubair Shafiq, Harkeerat Bedi, Amir Khakpour
IEEE International Conference on Network Protocols, Toronto, 2017

ICNP **Multipath TCP Traffic Diversion Attacks and Countermeasures**
Ali Munir, Zhiyun Qian, Zubair Shafiq, Alex Liu, Franck Le
IEEE International Conference on Network Protocols, Toronto, 2017

ICWSM **Scalable News Slant Measurement Using Twitter**
Huyen Le, Zubair Shafiq, Padmini Srinivasan
AAAI International Conference on Web and Social Media, Denver, 2017

HT **Bumps and Bruises: Mining Presidential Campaign Announcements on Twitter**
Huyen Le, G.R. Boynton, Yelena Mejova, Zubair Shafiq, Padmini Srinivasan
ACM Conference on Hypertext and Social Media, Prague, 2017

Networking **Cascade Size Prediction in Online Social Networks**
Zubair Shafiq, Alex Liu
IFIP Networking, Prague, 2017
Best Paper Award Candidate (3 nominations out of 43 accepted papers)

Networking **A Graph Theoretic Approach to Fast and Accurate Malware Detection**
Zubair Shafiq, Alex Liu
IFIP Networking, Prague, 2017

eCrime **Characterizing Key Stakeholders in an Online Black-Hat Marketplace**
Shehroze Farooqi, Muhammad Ikram, Emiliano De Cristofaro, Arik Friedman, Guillaume Jourjon, Dali Kaafar, Zubair Shafiq, Fareed Zaffar
IEEE/APWG Symposium on Electronic Crime Research, Prague, 2017

ICNP **Optimizing Internet Transit Routing for Content Delivery Networks**
Faraz Ahmed, Zubair Shafiq, Amir Khakpour, Alex Liu
IEEE International Conference on Network Protocols, Singapore, 2016

DSN **Malware Slums: Measurement and Analysis of Malware on Traffic Exchanges**
Salman Yousaf, Umar Iqbal, Shehroze Farooqi, Raza Ahmad, Zubair Shafiq, Fareed Zaffar
IEEE/IFIP International Conference on Dependable Systems and Networks, France, 2016

SIGMETRICS **QoE Analysis of a Large-Scale Live Video Streaming Event**
Adnan Ahmed, Zubair Shafiq, Amir R. Khakpour
ACM International Conference on Measurement and Modeling of Computer Systems, France, 2016

ICDCS **The Internet is For Porn: Measurement and Analysis of Online Adult Traffic**
Faraz Ahmed, Zubair Shafiq, Alex X. Liu
IEEE International Conference on Distributed Computing Systems, Japan, 2016

INFOCOM **Characterizing Caching Workload of a Large Commercial Content Delivery Network**
Zubair Shafiq, Amir R. Khakpour, Alex X. Liu
IEEE International Conference on Computer Communications, San Francisco, 2016

SIGSPATIAL **A Traffic Flow Approach to Early Detection of Gathering Events**
Xun Zhou, Amin Vahedian Khezerlou, Alex Liu, Zubair Shafiq, Fan Zhang
ACM International Conference on Advances in Geographic Information Systems, San Francisco, 2016

CIKM **The Rich and the Poor: A Markov Decision Process Approach to Optimizing Taxi Driver Revenue Efficiency**
Huigui Rong, Xun Zhou, Chang Yang, Zubair Shafiq, Alex Liu
ACM International Conference on Information and Knowledge Management, Indianapolis, 2016

TON **Characterizing and Optimizing Cellular Network Performance during Crowded Events**
Zubair Shafiq, Lusheng Ji, Alex X. Liu, Jeffrey Pang, Shobha Venkataraman, Jia Wang
IEEE/ACM Transactions on Networking, 2016

SMP **What Campaigns Become as Social Media Become the Infrastructure of Political Communication**
G.R. Boynton, Huyen Le, Yelena Mejova, Zubair Shafiq, Padmini Srinivasan
Social Media and Politics, 2016

TMC **Geospatial and Temporal Dynamics of Application Usage in Cellular Data Networks**
Zubair Shafiq, Lusheng Ji, Alex X. Liu, Jeffrey Pang, Jia Wang
IEEE Transactions on Mobile Computing, 2015

NSF/FCC **Tracking Mobile Video QoE in the Encrypted Internet**
QoE Zubair Shafiq
NSF/FCC Workshop on Tracking Quality of Experience in the Internet, Princeton, 2015

NSF/FCC **Bidirectional Crosslayer QoE Optimization**
QoE Srikanth Sundaresan, Zubair Shafiq
NSF/FCC Workshop on Tracking Quality of Experience in the Internet, Princeton, 2015

IMC **Paying for Likes? Understanding Facebook Like Fraud Using Honeypots**
Emiliano De Cristofaro, Arik Friedmam, Guillaume Jourjon, Dali Kaafar, Zubair Shafiq
ACM Internet Measurement Conference, 2014

SIGMETRICS **Understanding the Impact of Network Dynamics on Mobile Video User Engagement**
Zubair Shafiq, Jeffrey Erman, Lusheng Ji, Alex X. Liu, Jeffrey Pang, Jia Wang
ACM International Conference on Measurement and Modeling of Computer Systems, 2014

SIGMETRICS **Revisiting Caching in Content Delivery Networks**
Zubair Shafiq, Alex X. Liu, Amir Khakpour
ACM International Conference on Measurement and Modeling of Computer Systems, 2014

SIGMETRICS **A First Look at Cellular Network Performance during Crowded Events**
Zubair Shafiq, Alex X. Liu, Amir Khakpour
ACM International Conference on Measurement and Modeling of Computer Systems, 2013

ICNP **Who are You Talking to? Breaching Privacy in Encrypted IM Networks**
Muhammad U. Ilyas, Zubair Shafiq, Alex X. Liu, Hayder Radha
IEEE International Conference on Network Protocols, 2013

CSCW **Is News Sharing on Twitter Ideologically Biased?**
Jonathan Morgan, Cliff Lampe, Zubair Shafiq
ACM Conference on Computer Supported Cooperative Work and Social Computing, 2013

ACM HotNets **Cross-Path Inference Attacks on Multipath TCP**
Zubair Shafiq, Franck Le, Mudhakar Srivatsa, Alex X. Liu
ACM Workshop on Hot Topics in Networks, 2013

TON **Large Scale Measurement and Characterization of Cellular Machine-to-Machine Traffic**
Zubair Shafiq, Lusheng Ji, Alex X. Liu, Jeffrey Pang, Jia Wang
IEEE/ACM Transactions on Networking, 2013

JSAC **Identifying Leaders and Followers in Online Social Networks**
Zubair Shafiq, Muhammad U. Ilyas, Alex X. Liu, Hayder Radha
IEEE Journal on Selected Areas in Communications, 2013

JSAC **A Distributed Algorithm for Identifying Information Hubs in Social Networks**
Muhammad U. Ilyas, Zubair Shafiq, Alex X. Liu, Hayder Radha
IEEE Journal on Selected Areas in Communications, 2013

JNSM **TCAMChecker: A Software Approach to the Error Detection and Correction of TCAM-based Networking Systems**
Zubair Shafiq, Chad Meiners, Alex Liu, Ke Shen, Zheng Qin
Springer Journal of Network and Systems Management, 2012

ICNP **A Semantics Aware Approach to Automated Reverse Engineering Unknown Protocols**
Yipeng Wang, Xiaochun Yun, Zubair Shafiq, Alex X. Liu, Zhibin Zhang, Liyan Wang, Danfeng (Daphne) Yao, Yongzheng Zhang, Li Guo
IEEE International Conference on Network Protocols, 2012
Best Paper Award

SIGMETRICS **A First Look at Cellular Machine-to-Machine Traffic – Large Scale Measurement and Characterization**
Zubair Shafiq, Lusheng Ji, Alex X. Liu, Jeffrey Pang, Jia Wang
ACM International Conference on Measurement and Modeling of Computer Systems, London, 2012

ICSE **A Large Scale Exploratory Analysis of Software Vulnerability Life Cycles**
Muhammad Shahzad, Zubair Shafiq, Alex X. Liu
International Conference on Software Engineering, Switzerland, 2012

INFOCOM **Characterizing Geospatial Dynamics of Application Usage in a 3G Cellular Data Network**
Zubair Shafiq, Lusheng Ji, Alex X. Liu, Jeffrey Pang, Jia Wang
IEEE Conference on Computer Communications, Orlando, 2012

SIGMETRICS **Characterizing and Modeling Internet Traffic Dynamics of Cellular Devices**
Zubair Shafiq, Lusheng Ji, Alex X. Liu, Jia Wang
ACM International Conference on Measurement and Modeling of Computer Systems, San Jose, 2011

Networking **A Random Walk Approach to Modeling the Dynamics of the Blogosphere**
Zubair Shafiq, Alex X. Liu
IFIP Networking, Spain, 2011

INFOCOM **A Distributed and Privacy-Preserving Algorithm for Identifying Information Hubs in Social Networks**
Muhammad U. Ilyas, Zubair Shafiq, Alex X. Liu, Hayder Radha
IEEE Conference on Computer Communications, Spain, 2011

RAID **PE-Miner: Mining Structural Information to Detect Malicious Executables in Realtime**
Zubair Shafiq, Syeda Momina Tabish, Fauzan Mirza, Muddassar Farooq
International Symposium On Recent Advances In Intrusion Detection, France, 2009

GECCO **Evolvable Malware**
Sadia Noreen, Shafaq Murtaza, Zubair Shafiq, Muddassar Farooq
ACM Genetic and Evolutionary Computation Conference, Canada, 2009

CCS AISec **Using Spatio-Temporal Information in API Calls with Machine Learning Algorithms for Malware Detection and Analysis**
Faraz Ahmed, Haider Hameed, Zubair Shafiq, Muddassar Farooq
Workshop on Security and Artificial Intelligence, ACM Conference on Computer & Communications Security, Chicago, 2009

KDD CSI **Malware Detection using Statistical Analysis of Byte-Level File Content**
Syeda Momina Tabish, Zubair Shafiq, Muddassar Farooq
Workshop on CyberSecurity and Intelligence Informatics (CSI), ACM Conference on Knowledge Discovery and Data Mining, France, 2009

VB **PE-Probe: leveraging packer detection and structural information to detect malicious portable executables**
Zubair Shafiq, Syeda Momina Tabish, Muddassar Farooq
Virus Bulletin, Switzerland, 2009

Elsevier **Fuzzy Case Based Reasoning for Facial Expression Recognition**
Aasia Khanum, Muid Mufti, M. Y. Javed, Zubair Shafiq
Elsevier Fuzzy Sets and Systems, 2009

EvoComNet **A Comparative Study of Fuzzy Inference Systems, Neural Networks and Adaptive Neuro Fuzzy Inference Systems for Portscan Detection**
Zubair Shafiq, Muddassar Farooq, Syed Ali Khayam
Applications of Evolutionary Computing, EvoComNet, Italy, 2008

DIMVA **Embedded Malware Detection using Markov n-grams**
Zubair Shafiq, Syed Ali Khayam, Muddassar Farooq
International Conference on Detection of Intrusions, Malware and Vulnerability Assessment, France, 2008

GECCO **Improving Accuracy of Immune Inspired Malware Detectors using Intelligent Features**
Zubair Shafiq, Syed Ali Khayam, Muddassar Farooq
ACM Genetic and Evolutionary Computation Conference, Atlanta, 2008

Funding

External Competitive Research Grants

NSF-SaTC-EAGER **News and Public Affairs Information**
National Science Foundation
PI, Duration: 2024-2026, Total: $300,000, Personnel: Magdalena Wojcieszak (PI), Zubair Shafiq (Co-PI)

UC **Auditing Compliance of Data Privacy Laws in California**
UC Partnerships in Computational Transformation
PI, Duration: 2022-2023, Total: $160,000, Share: $80,000
Personnel: Zubair Shafiq (PI: UC Davis); Athina Markopoulou (PI: UC Irvine); Gene Tsudik (Co-PI: UC Irvine)

NSF-SaTC **Defending against Emerging Stateless Web Tracking**
National Science Foundation
PI, Duration: 2022-2026, Total: $1,200,000, Share: $400,000
Personnel: Zubair Shafiq (PI: UC Davis); Alexandros Kapravelos (PI: NC State); Anupam Das (Co-PI: NC State)

CITRIS and the Banatao Institute **Auditing the compliance of California consumer privacy regulations at scale**
Center for Information Technology Research in the Interest of Society (CITRIS)
Co-PI, Duration: 2021-2022, Total: $60,000, Share: $20,000
Personnel: Serge Egelman (Co-PI: UC Berkeley); Zubair Shafiq (Co-PI: UC Davis)

NSF-SaTC-Frontier **Protecting Personal Data Flow on the Internet**
National Science Foundation
PI, Duration: 2020-2025, Total: $10,000,000, Share: $1,100,000
Personnel: Zubair Shafiq (PI: UC Davis); Athina Markopoulou (PI: UC Irvine); Konstantinos Psounis (PI: USC); David Choffnes (PI: Northeastern)

NSF-CAREER **Quality of Experience and Network Management in the Encrypted Internet**
National Science Foundation
PI, Duration: 2018-2023, Total: $500,000, Share: $500,000
Personnel: Zubair Shafiq (PI: UC Davis)

NSF-SaTC **A Multi-Layer Learning Approach to Mobile Traffic Filtering**
National Science Foundation
PI, Duration: 2018-2021, Total: $500,000, Share: $250,000
Personnel: Zubair Shafiq (PI: UC Davis); Athina Markopoulou (PI: UC Irvine)

NSF-SaTC **The Web Ad Technology Arms Race: Measurement, Analysis, and Countermeasures**
National Science Foundation
PI, Duration: 2017-2020, Total: $500,000 + $16,000 (REU Supplement 2019) + $16,000 (REU Supplement 2021), Share: $282,000
Personnel: Zubair Shafiq (PI: UC Davis); Zhiyun Qian (PI: UC Riverside)

NSF-NeTS **Towards Scalable and Energy Efficient Cellular IoT Communication**
National Science Foundation
PI, Duration: 2016-2019, Total: $500,000, Share: $166,000
Personnel: Zubair Shafiq (PI: Iowa); K.K. Ramakrishnan (PI: UC Riverside); Koushik Kar (PI: RPI)

NSF-SaTC **Multipath TCP Side Channel Vulnerabilities and Defenses**
National Science Foundation
PI, Duration: 2015-2018, Total: $500,000, Share: $167,000
Personnel: Zubair Shafiq (PI: Iowa); Zhiyun Qian (PI: UC Riverside); Alex Liu (PI: Michigan State University)

NSF-NeTS **Towards Measurement and Optimization of Internet Video Quality of Experience**
National Science Foundation
PI, Duration: 2015-2018, Total: $175,000 + $16,000 (REU Supplement 2016), Share: $191,000
Personnel: Zubair Shafiq (PI: Iowa)

DTL **Detection and Circumvention of Ad-Block Detectors**
Data Transparency Lab
PI, Duration: 2016-2017, Total: $56,000, Share: $28,000
Personnel: Zubair Shafiq (PI: Iowa); Zhiyun Qian (PI: UC Riverside)

Internal Competitive Research Grants

Academic Senate **Socio-Computational Interventions to Mitigate Misinformation in Recommendations**
Noyce Foundation
PI, Duration: 2022-2023, Total: $25,000
Personnel: Magdalena Wojcieszak (PI), Zubair Shafiq (Co-PI)

Noyce **Measuring and Mitigating Biases in Social Recommendation Algorithms**
Noyce Foundation
PI, Duration: 2022-2023, Total: $236,000
Personnel: Zubair Shafiq (PI), Magdalena Wojcieszak (Co-PI)

Noyce **Cross-Layer Approach to Enhance Security/Privacy of AI-enabled IoT Eco-Systems**
Noyce Foundation
Co-PI, Duration: 2022-2023, Total: $225,000
Personnel: Chen-Nee Chuah (PI), Zubair Shafiq (Co-PI), Houman Homayoun (Co-PI)

Noyce **Measuring and Mitigating Biases in Social Recommendation Algorithms**
Noyce Foundation
PI, Duration: 2021-2022, Total: $235,690
Personnel: Zubair Shafiq (PI), Xin Liu (Co-PI), Magdalena Wojcieszak (Co-PI)

Noyce **Cross-Layer Approach to Enhance Security/Privacy of AI-enabled IoT Eco-Systems**
Noyce Foundation
Co-PI, Duration: 2021-2022, Total: $225,000
Personnel: Chen-Nee Chuah (PI), Zubair Shafiq (Co-PI), Houman Homayoun (Co-PI)

UIRF **Social Media Powered Real-Time Digital News Recommendation**
University of Iowa Research Foundation
PI, Duration: 2015-2016, Total: $75,000
Personnel: Zubair Shafiq (PI)

Obermann **Heterogeneous Network Data Analytics to Improve Urban Sustainability**
Obermann Center Interdisciplinary Research Grant
PI, Duration: 2015-2016, Total: $12,000
Personnel: Xun Zhou (PI); Zubair Shafiq (Co-PI)

Industry Grants and Unrestricted Gifts

Siemens PI, Duration: 2021, Total: $60,000, Share: $60,000
Personnel: Zubair Shafiq (PI: UC Davis)

Siemens PI, Duration: 2019, Total: $30,000, Share: $30,000
Personnel: Zubair Shafiq (PI: Iowa)

Siemens PI, Duration: 2018, Total: $60,000, Share: $60,000
Personnel: Zubair Shafiq (PI: Iowa)

Verizon PI, Duration: 2018, Total: $20,000, Share: $20,000
Personnel: Zubair Shafiq (PI: Iowa)

Minim PI, Duration: 2018, Total: $66,164, Share: $66,164
Personnel: Zubair Shafiq (PI: Iowa)

Siemens PI, Duration: 2017, Total: $30,000, Share: $30,000
Personnel: Zubair Shafiq (PI: Iowa)

Nokia PI, Duration: 2017, Total: $53,200, Share: $53,200
Personnel: Zubair Shafiq (PI: Iowa)

Futurewei PI, Duration: 2017, Total: $100,384, Share: $100,384
Personnel: Zubair Shafiq (PI: Iowa)

Facebook PI, Duration: 2016, Total: $8,400, Share: $8,400
Personnel: Zubair Shafiq (PI: Iowa)

Teaching

ECS 289M **Topics in Privacy**
Spring 2024, University of California at Davis

ECS 188 **Ethics in an Age of Technology**
Winter 2024, University of California at Davis

ECS 152A **Computer Networks**
Fall 2023, University of California at Davis

FYS **Big Data, Big Brother**
Winter 2023, University of California at Davis

ECS 289M **Network Security & Privacy**
Winter 2023, University of California at Davis

ECS 152A **Computer Networks**
Fall 2022, University of California at Davis

ECS 152A **Computer Networks**
Spring 2022, University of California at Davis

ECS 153 **Computer Security**
Winter 2022, University of California at Davis

ECS 289M **Data-Driven Security**
Spring 2021, University of California at Davis

ECS 152B **Computer Networks**
Winter 2021, University of California at Davis

CS 2620 **Networking & Security for Informatics**
Spring 2020, The University of Iowa

CS 4980 **Online Advertising & Tracking**
Fall 2019, The University of Iowa

CS 2620 **Networking & Security for Informatics**
Spring 2019, The University of Iowa

CS 4980 **Internet Measurement**
Fall 2018, The University of Iowa

CS 2620 **Networking & Security for Informatics**
Spring 2018, The University of Iowa

CS 2620 **Networking & Security for Informatics**
Spring 2017, The University of Iowa

CS 4980 **Network Security and Privacy**
Fall 2016, The University of Iowa

CS 2620 **Networking & Security for Informatics**
Spring 2016, The University of Iowa

CS 4980 **Advanced Computer Networks**
Fall 2015, The University of Iowa

CS 2620	**Networking & Security for Informatics** Spring 2015, The University of Iowa
CS 4980	**Internet Measurement** Fall 2014, The University of Iowa

Students

Doctorate

2022-current	Rajvardhan Oak
2021-current	Pouneh Nikkhah Bahrami
2021-current	Shaoor Munir
2021-current	Yash Vekaria
2021-current	Hari Venugopalan (co-advised with Sam King)
2016-2021	Dr. Umar Iqbal; First Position: CIFellow/Postdoc, University of Washington
2015-2021	Dr. Shehroze Farooqi; First Position: Researcher, Palo Alto Networks
2015-2019	Dr. Huyen Le; First Position: Postdoc, National Center for Toxicological Research

Select Recent Masters Mentees

2021	Mohammad Ismail Daud
2021	Sunshine Chong
2021	Rachit Dhamija
2020	Pouneh Nikkhah Bahrami
2018	Daniel Zhou
2016-2017	Sai Kalyan Moguloju

Select Recent Undergraduate Mentees

2023	Divya Raj
2023	Shuaib Ahmed
2023	Ryan Swift
2023	Tangbaihe Wang
2023	Patrick Lee
2022	Jake Smith
2022	Christina Phan
2022	Kev Rockwell
2020-2022	Kajal Patel (NSF REU)
2020-2022	Wanyue Zhai (graduate student at Stanford)
2020-2022	Ray Ngan (NSF REU) (industry: Palo Alto Networks)
2020-2021	Surya Konkimalla
2020-2021	Charles Nguyen (industry: Apple)
2019-2021	Charlie Wolfe (NSF REU) (industry: Apple)
2021	Caelan MacArthur (NSF DREU)
2020-2021	Taimur Kashif (NSF REU) (industry: VMWare)
2019-2020	Ashton Woiwood (NSF REU)
2018	Basil Chatha

2017	Treyton Krupp (NSF REU)
2017	Daniel Zhou (NSF REU)
2017	Gabriel Akanni (SROP)
2016-2017	Xiaoye Li (NSF REU)
2016	Yu Dai

High School

2023	Reeva Rao
2023	Jayalakshmi Raffill
2019	Kathy Zhong
2018	Alice Martynova
2017	William Kim
2016	Brandon Wang

External Service

Conference TPC/Reviewer IEEE S&P (2022), PETS (2021, 2020, 2019, 2018, 2017), ACM IMC (2021, 2020), ACM CoNEXT (2019), ACM SIGMETRICS (2023, 2022, 2020, 2013), WWW (2020, 2018), ACM CSCW (2018, 2019), IEEE/IFIP TMA (2020, 2019), NDSS MADWeb Workshop (2019), IEEE INFOCOM (2017, 2015, 2010, 2009), ACM WPES (2018), IEEE S&P Consumer Protection Workshop (2021, 2020), ACM SIGCOMM Internet-QoE Workshop (2017), ACM SIGCOMM Workshop on IoT Security and Privacy (2018), WWW CyberSafety Workshop (2018), WWW Workshop on Location and the Web (2018), IEEE ICNP (2014, 2013), MASCOTS (2013), ICDCN (2017, 2018)

Journal Reviewer IEEE/ACM Transactions on Networking, ACM Transactions on the Web, IEEE Transactions on Mobile Computing, IEEE Transactions on Network and Service Management, ACM Transactions on Multimedia Computing, IEEE Transactions on Cognitive Communications and Networking, ACM SIGCOMM Computer Communication Review, Elsevier Computer Communications, Elsevier Performance Evaluation, Springer Wireless Networks

PC Co-Chair Privacy Enhancing Technologies Symposium (PETs), 2025

PC Co-Chair Privacy Enhancing Technologies Symposium (PETs), 2024

PC Co-Chair Workshop on Technology and Consumer Protection (ConPro'23), IEEE Symposium on Security & Privacy ("Oakland")

PC Co-Chair Workshop on Technology and Consumer Protection (ConPro'22), IEEE Symposium on Security & Privacy ("Oakland")

PC Co-Chair Workshop on Measurements, Attacks, and Defenses for the Web (MADWeb'23), Network and Distributed System Security Symposium (NDSS)

PC Co-Chair Workshop on Measurements, Attacks, and Defenses for the Web (MADWeb'22), Network and Distributed System Security Symposium (NDSS)

Publicity Co-Chair ACM International Conference on emerging Networking EXperiments and Technologies (CoNEXT 2020)

Co-Chair NSF NeTS Early Career Investigators Workshop 2019

PC Co-Chair Student Workshop - ACM International Conference on emerging Networking EXperiments and Technologies (CoNEXT 2018)

PC Co-Chair WWW 8th International Workshop on Location and the Web (LocWeb 2018)

Poster Chair	ACM/IEEE Symposium on Architectures for Networking and Communications Systems (ANCS 2018)
Technical Committee	Elsevier Computer Communications (2015-2019)
Guest Editor	Special Issue on Mobile Traffic Analytics, Elsevier Computer Communications (2016)
Editorial Board	Proceedings on Privacy Enhancing Technologies (PoPETs) (2019, 2020, 2021)
Panelist	NSF (2017, 2018, 2019, 2020, 2021, 2022, 2023)

Internal Service

Chair	Departmental Colloquium Series Department of Computer Science, University of California Davis, 2021-
Member	Diversity, Equity, Inclusion Committee College of Engineering, University of California Davis, 2021-2022
Committee	Departmental Graduate Committee Department of Computer Science, University of Iowa, 2019-2020
Chair	Departmental Colloquium Series Department of Computer Science, University of Iowa, 2019-2020
Member	Executive Committee, Iowa Initiative for Artificial Intelligence (IIAI) The University of Iowa, 2019-2020
Member	Department Executive Committee Department of Computer Science, The University of Iowa, 2016-2019
Member	Faculty Recruitment Committee Department of Computer Science, The University of Iowa, 2015-2020
Mentor	Black Girls Do Science College of Engineering, The University of Iowa, 2015-2016
Mentor	Iowa Edge Classroom Experience Center for Diversity and Enrichment, The University of Iowa, 2015-2018
Mentor	Summer Research Opportunities Program (SROP) Graduate College, The University of Iowa, 2017
Mentor	Secondary Student Training Program (SSTP) Belin-Blank Center, The University of Iowa, 2016-2019

Patents

USPTO 10484881	Jia Wang, Lusheng Ji, Alex X. Liu, Zubair Shafiq. Optimization of cellular network architecture based on device type-specific traffic dynamics. November 2019
USPTO 10420167	Jia Wang, Lusheng Ji, Alex X. Liu, Jeffrey Pang, Zubair Shafiq. Cellular Connection Sharing. September 2019

Expert Testimony & Reports (in the past ten years)

4:20-cv-05146	**Calhoun v. Google**
4:21-cv-02155	**In re Google RTB Consumer Privacy Litigation**

5:23-cv-02431	**Doe v. Google**
22-01-88230-D	**State of Texas v. Google**
A 2002633	**Doe v. Bon Secours Mercy Health**
24-C-20-000591	**Doe v. Medstar Health**
19-2-26674-1	**Doe v. Virginia Mason**
23CV037304	**Doe v. Family Planning Associates Medical Group**
22-cv-03580	**In re Meta Pixel Healthcare Litigation**
23OT01-0026	**Stake v. Knox**
23-cv-00964	**Griffith v. TikTok**
22STCV36304	**Doe v. Adventist**
3:22-cv-07465	**Hazel v. Prudential**
4:22-cv-04423	**Beke v. Fandom**
3:22-cv-08981	**Lau v. Gen Digital**

Litigation Consulting (in the past ten years)

Bleichmar Fonti & Auld

Simmons Hanly Conroy

Lieff Cabraser Heimann & Bernstein

DiCello Levitt Gutzler

Norton Rose Fulbright

Pritzker Levine

Social Media Victims Law Center

Girard Sharp

Hammond Law

Caddell & Chapman

Whatley Kallas

Office of the Attorney General, Texas

AZA Law

Susman Godfrey